MULTIFUNCTION CAR THEFT ALARM LOCK WITH TIRE PRESSURE SENSING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a car theft alarm lock device and, more particularly, to such a multifunction car theft alarm lock with tire pressure sensing device.

2. Description of Related Art

Following fast increasing of personal income in recent years in most countries around the world, most people can afford to have a car for use as a transportation vehicle or for outdoor sports. Because of its high value, a car is an attractive object to thieves, and because of the security system of the car is not perfect, a thief can steal the car easily. Thus, when buying a car, every consumer always considers the security system of the car an important factor.

US Patent No. 6,199,415 discloses a vehicle theft alarm lock, entitled "ANTI-THEFT STEERING WHEEL BLOCKING LOCK", which comprises, in addition to an electronic alarm subassembly, a motion detector to detect the motion of the car. However, when a thief intrudes into the car without causing a motion of the car, the protection function of the anti-theft steering wheel blocking lock becomes invalid. US Patent No. 6,433,678/B1 discloses a vehicle theft alarm lock, entitled "VEHICLE THEFT ALARM LOCK", which comprises a pressure sensing circuit. The protection function of this design of vehicle theft alarm lock fails if one

window of the car is not closed tightly enough or one door of the car is opened gently by the thief.

The above lock devices cannot communicate with car owners who have no idea about the status of their vehicles or the above lock devices, and thus the theft alarm protection measures of the above lock devices are not satisfactory. Furthermore, when the independent power supplies for the above locks fail, the electronic members of the above lock devices cannot work normally and so cannot inform the car owners of thief intrusion. At this time, only the mechanical lock members can provide the protection. However, the thief can easily overcome the limited protection of the above lock devices.

Therefore, it is desirable to provide a multifunction car theft alarm lock with tire pressure sensing device that eliminates the aforesaid drawbacks and provides safety of the car.

SUMMARY OF THE INVENTION

It is the main object of the present invention to provide a multifunction car theft alarm lock including a digital ID recognition function, providing a better protection than the mechanical car theft alarm locks.

It is another object of the present invention to provide a multifunction car theft alarm lock with a tire pressure sensing device, which detects the status of the tire pressure and indicates the detected result by means of sound and light, thus improving the safety of the car.

It is still another object of the present invention to provide a

multifunction car theft alarm lock, which has an infrared sensor installed therein to enhance the detection of criminals.

It is still another object of the present invention to provide a multifunction car theft alarm lock, which has a two-way transmission function to provide the car owner with the current status of the car.

It is still another object of the present invention to provide a standby power set for the multifunction car theft alarm lock, which keeps the alarm lock working when the internal power supply of the lock fails.

To achieve these and other objects of the present invention, the car theft alarm lock for use in a steering wheel of a transportation vehicle comprises: a lock unit coupled to the steering wheel; a key insertable into the lock unit for releasing the coupling between the lock unit and the steering wheel; at least one electronic sensor installed in an electronic module thereof, the at least one electronic sensor being used to detect vertical and horizontal vibrations of the transportation vehicle, movement of an object inside the transportation vehicle, and output a signal of detection, wherein the electronic module not only inputs the signal of detection and outputs the signal of detection to a far end, but also inputs a signal of setting from the far end; a function setting device used to input and indicate the signal of detection from the electronic module, and set and output the signal of setting to enable/disable the at least one electronic sensor; a power supply unit used to provide the necessary working power to the lock unit and the electronic module; a standby power set used to provide a standby power supply; and a standby power circuit used to provide the

standby power supply to the lock unit and the electronic module if the power supply unit fails.

The invention also provides a multifunction car theft alarm lock with tire pressure sensing device, which comprises: a lock unit coupled to a steering wheel of the transportation vehicle; a key insertable into the lock unit for releasing the coupling between the lock unit and the steering wheel; a sensor module with at least one sensing function used to detect a static/motion status of the transportation vehicle and to output a signal of detection when the static/motion status of the transportation vehicle has been changed one way or the other; at least one tire pressure sensor for detecting a status of the tire pressure of the transportation vehicle and for transmitting a signal of low pressure if the pressure of one tire drops below a predetermined pressure value; an electronic module including the sensor module installed in the lock unit, for inputting the signal of low pressure and outputting the signal of detection and the signal of low pressure to a far end; a setting device for inputting the signal of detection/the signal of low pressure and providing a sound and lighting effect corresponding to the signal of detection/the signal of low pressure; a power supply unit for providing a necessary working power to the lock unit and the electronic module; a standby power set for providing a standby power supply; and a standby power circuit for providing the standby power supply to the lock unit and the electronic module if the power supply unit fails.

The multifunction car theft alarm lock with tire pressure sensing device provides multiple sensing functions to enhance anti-theft protection

and to detect the pressure status of tires; with two-way signal transmission function for vehicle drivers to set the functions of the lock, and to be informed about the detected result.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing a multifunction car theft alarm lock according to the present invention, fitted to a car.

FIG. 2 is a schematic drawing showing an arrangement of the digital electronic lock and the digital electronic key of the multifunction car theft alarm lock according to the present invention.

FIG. 3 is a block diagram of a digital electronic lock and key of the multifunction car theft alarm lock according to the present invention.

FIG. 4 is a block diagram of the power supply unit, standby power circuit and standby power set of the multifunction car theft alarm lock according to the present invention.

FIG. 5 is a block diagram of the electronic module and function setting device of the multifunction car theft alarm lock according to the present invention.

FIG. 6 is a block diagram of the sensor module of the electronic module of the multifunction car theft alarm lock according to the present invention.

FIG. 7 is a schematic drawing showing the multifunction car theft alarm lock with tire pressure sensing device according to the present invention.

FIG. 8 is a schematic drawing showing an arrangement of the tire

pressure sensor according to the present invention.

FIG. 9 is a block diagram of an alternative form of the electronic module and function setting device of the multifunction car theft alarm lock with tire pressure sensing device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a multifunction car theft alarm lock used in a car **10** is shown. The multifunction car theft alarm lock includes two parts, namely, a lock unit **16** and a remote controller **14**. The lock unit **16** is activated to lock a steering wheel **12** of the car **10**. The remote controller **14** is designed to disable the locking status of the lock unit **16**. When the steering wheel **12** is locked, the car **10** can only move straight forwards or backwards, and therefore a thief cannot drive the car **10** away, i.e., cannot steal the car **10**.

Referring to FIG. 2, the lock unit **16** comprises a lock body **17** and a handle **19**. The lock body **17** includes a mechanical lock or a digital electronic lock **110** for locking (coupling) the lock unit **16** to the steering wheel **12** (controller). The handle **19,** has installed therein, an electronic module **210** adapted to provide detection and alarm functions. If the lock body **17** includes a mechanical lock, the locking status will be disabled from the steering wheel **12** when inserting a matching key into the lock body **17**. If the lock body **17** includes a digital electronic lock **110** installed therein, the locking status of the lock unit **16** will be disabled from the steering wheel **12** when inserting a matching digital electronic key **140,** which is

incorporated into the remote controller **14,** into the digital electronic lock **110**. Because a digital electronic lock has more advantages than a mechanical lock (for example, duplicating a matching digital electronic key is not easy), the multifunction car theft alarm lock has installed therein the digital electronic lock **110.** However, this is not a limitation.

Referring to FIGS, 3-6, the multifunction car theft alarm lock is divided into a digital electronic lock **110**, a digital electronic key **140**, a power supply unit **150**, a standby power circuit **160**, a standby power set **170**, an electronic module **210**, and a function setting device **222**. The digital electronic lock **110**, the power supply unit **150**, the standby power circuit **160**, and the electronic module **210** are installed in the lock unit **16**; while the function setting device **222** and the digital electronic key **140** are installed in the remote controller **14**. It is understood that the function setting device **222** and the digital electronic key **140** can be independent from each other and used separately. The positions of the aforesaid elements are determined subject to actual requirements, not limited to the aforesaid example.

FIG. 3 is a block diagram of the digital electronic lock **110** and the digital electronic key **140**. The digital electronic lock **110** comprises a digital ID sensor **122**, a third memory **124**, and a slot **126**. When the digital electronic lock **110** touches the steering wheel **12**, the digital electronic lock motor (not shown) is activated to drive a gear (not shown) to further lock the lock unit **16** in the steering wheel **12**. The third memory **124** stores a digital ID (identification) code and the digital electronic key **140** stores

therein a corresponding digital ID code. When the digital electronic key **140** is inserted into the slot **126**, the digital ID sensor **122** detects if the digital ID code in the digital electronic key **140** matches the corresponding digital ID code in the third memory **124**. If both digital ID codes match, the digital electronic lock motor is driven to unlock the car theft alarm lock **16** from the steering wheel **12**. Because the encoding of the digital ID codes is complex, it is not easy to decode the digital ID codes within a short time. Therefore, the multifunction car theft alarm lock provides a good protection to the car. The aforesaid digital electronic lock **110** and digital electronic key **140** are exemplified only. Other similar commercially available products may be used.

FIG. 4 is a block diagram of the power supply unit **150**, the standby power circuit **160**, and the standby power set **170**. The power supply unit **150** has a plurality of DC batteries mounted therein for providing necessary working power to the elements contained in the lock unit **16**. The power supply unit **150** further comprises a power detector **152** and a power alarm **154**. The power detector **152** detects the power status of the power supply unit **150**, and enables the power alarm **154** when the power status is low. The power alarm **154** can be an LED (Light Emitting Diode) as a visual alarm, and a buzzer as an audio alarm. When the power of the power supply unit **150** drops below a predetermined low level, the power detector **152** activates the power alarm **154** to send a visual or audio alarm signal.

The standby power set **170** has at least one DC battery installed therein and electrically connected to the standby power circuit **160**. The

internal circuit of the standby power circuit **160** is electrically connected to the power supply unit **150**. When the power provided by the power supply unit **150** is insufficient to drive the electronic lock motor, i.e., when the digital electronic lock **110** fails, the vehicle user can insert the standby power set **170** into the standby power circuit **160**, so as to enable the standby power set **170** to provide necessary working power to the digital electronic lock **110**. Furthermore, the power supply unit **150** also provides the necessary working power to the electronic module **210**.

FIG. 5 is a block diagram of the electronic module **210** and the function setting device **222**. The electronic module **210** comprises a sensor module **212**, an alarm **214**, a first microprocessor **216**, a first transceiver **218**, and a first memory **220**. As illustrated in FIG. 6, the sensor module **212** comprises a horizontal motion sensor **202**, a vertical motion sensor **204**, and an infrared sensor **206**. The horizontal motion sensor **202** is used to detect horizontal vibration of the car 10 (such as opening doors). The vertical motion sensor **204** is used to detect vertical vibration of the car **10** (such as intruding the car **10**). The infrared sensor **206** is used to detect movement of an object (such as a human body) in the car **10**. The car **10** stands at a static status after the function setting device **222** enables the sensor module **212**, and the car **10** will change from the static status to a motion status when the door is opened, so that an abnormally shock is detected, or that a human body moving in the car **10** is detected. If the car **10** changes to a motion status, the sensor module **212** immediately sends a signal of detection to the first microprocessor **216** and the alarm **214**. Upon receipt of the signal of

detection, the microprocessor **216** outputs the signal of detection to somewhere, such as a far end, via the first transceiver **218**. Further, the first transceiver **218** can also receive a signal of setting from the far end and then outputs the received signal of setting to the first microprocessor **216**. The alarm **214** can be an LED or buzzer, or their combination. When receiving a signal of detection, the alarm **214** produces a visual and/or audio alarm to threaten the intruder.

Further, the horizontal motion sensor **202** and the vertical motion sensor **204** are identical devices apart from their positioning, and are each formed of the same electronic device. For instance, an electronic vibration sensor, which has one end relatively heavier, and the other end for mounting. When the electronic device is in a vertical position, it is used as a horizontal motion sensor 202; and when the electronic device is in a horizontal position, it is used as a vertical motion sensor 204. Because the horizontal motion sensor **202** and the vertical motion sensor **204** are identical with each other, the manufacturing cost of the sensor module **210** is minimized.

As indicated above, the lock body **16** should be coupled to the steering wheel **12** of the car **10** to provide a better protection. However, in addition, the electronic module **210** provides the car **10** with static and motion status detection and alarm functions.

The function setting device **222** is a one-way communication device and adapted to receive the signal of detection from the first transceiver **218**, and comprises a second receiver, a display panel **226**, a second memory **230**, and a second microprocessor **232**. The display panel **226** is formed of an

array of LEDs, an LCD (liquid crystal display), or a buzzer. After the second receiver receives the signal of detection from the electronic module **210,** it outputs the received signal of detection to the second microprocessor **232**. Upon receiving the signal from the second transceiver **224**, the microprocessor **232** enables the display panel **226**, causing the display panel **226** to produce a visual or audio alarm to the owner of the car **10**.

Alternatively, the function setting device **222** can be a two-way communication device after replacing the second receiver with a second transceiver **224**, and further comprises a function setting face panel **228**. The second transceiver **224** not only receives the signal of detection but also outputs a signal of setting to the first transceiver **218**. The function setting face panel **228** comprises a plurality of function keys for operation by the user to enable or disable the sensor module **212** or alarm **214**. When the function setting face panel **228** is operated by the user, the function setting face panel **228** outputs the signal of setting to the second microprocessor **232**, thereby causing the second microprocessor **232** to output the signal of setting to the first microprocessor **216** via the second transceiver **224** and the first transceiver **218**. Upon receipt of the signal of setting, the first microprocessor **216** enables or disables the sensor module **212** or alarm **214**. The function keys of the function setting face panel **228** are adapted to enable/disable one or all of the horizontal motion sensor **202**, vertical motion sensor **204** and infrared sensor **206** of the sensor module **212**, and to enable/disable the alarm **214**.

Further, the first microprocessor **216** can also produce a

communication code, store the communication code in the first memory **220**, and transmit the communication code to the function setting device **222**. Alternatively, the first microprocessor **216** can automatically produce the communication code at random. When receiving the communication code from the electronic module **210**, the function setting device **222** stores the communication code in the second memory **230**. As the function setting device **222** outputs the signal of setting, the first microprocessor **216** compares the communication code in the first memory **220** to the communication code received from the electronic module **210**. If the communication codes match, the first microprocessor **216** accepts the signal of setting. Further, the second microprocessor **232** can measure the distance between the function setting device **222** and the electronic module **210** by calculating the duration of transmitting or receiving signals between the function setting device **222** and the electronic module **210**, and indicates the distance status in the display panel **226**. The aforesaid distance measuring function or communication code generating function can be provided by either of the first microprocessor **216** or the second microprocessor **232**.

Further, four tire pressure sensors can be incorporated into the multifunction car theft alarm lock, as shown in FIG. 7, forming a multifunction car theft alarm lock with tire pressure sensing device, which includes three parts, namely, the tire pressure sensors **13**, the remote controller **14**, and the lock body **16**. The remote controller **14** and the lock body **16** are the same as the like members in the aforesaid multifunction car

theft alarm lock. The tire pressure sensors **13** are adapted to detect the tire pressure (air pressure) of the tires **18** of the car **10**, and to output the detected result to the lock body **16**.

Referring to FIG. 8, the tire pressure sensors **13** are coupled to the air nozzles **180** of the tires **18** or installed inside of the tires **18**, and are connected to a third transmitter **132** respectively. As illustrated in FIG. 9, the display panel **226** further comprises a tire pressure indicator **134**. The tire pressure sensors **13** detect the pressure of the tires **18**. If the pressure of one tire **18** drops below a predetermined value, the corresponding tire pressure sensor **13** outputs a signal of low pressure to the third transmitter **132**, which in turn transmits the signal of low pressure to the first microprocessor **216** for further processing via the first transceiver **218**. Upon receipt of the signal of low pressure, the first microprocessor **216** enables the alarm **214** and the tire pressure indicator **134**, and at the same time outputs the signal of low pressure to the function setting device **222**, causing the second microprocessor **232** to enable the display panel **226**. Thus, the user knows the status of tire pressure and can immediately take the necessary steps to ensure a safety driving. Further, the user can operate the function setting face panel **228** to disable the tire pressure indicator **134**, the alarm **214**, or the display panel **226**. The tire pressure sensor **13** can be a mechanical device, for example, the "DIAPHRAGM-TYPE TIRE PRESSURE INDICATOR" disclosed in US Patent No. 6,525,655 or the "TIRE PRESSURE INDICATOR" disclosed in US Patent No. 5,289,161. Alternatively, the tire pressure sensor **13** can be an electronic type, for

example, the "TIRE PRESSURE INDICATOR" disclosed in US Patent No. 5,694,111.

The communication technology employed to the first transceiver **218**, the second transceiver **224** and the transmitter **132** can be subject to user's requirements either digital wireless communication technology or analog mode.

As indicated above, the multifunction car theft alarm lock with tire pressure sensing device provides better anti-theft function than prior art designs, and can inform the user of the current status of the lock body **16** via the function setting device **222**. Further, the multifunction car theft alarm lock with tire pressure sensing device provides the user with the information of current tire pressure status, ensuring a safety driving.

Although the present invention has been explained in relation to its preferred embodiments, it is understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.